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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/526,486	03/04/2005	Akimitsu Hatta	047297-0143	1871

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EXAMINER

SONG, MATTHEW J

ART UNIT	PAPER NUMBER
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1722

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/07/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/526,486

Applicant(s)

HATTA ET AL.

Examiner

Matthew J. Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>3/4/05; 4/21/06</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 1-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 5-6 claim producing acicular silicon crystals by plasma CVD using a catalyst while supplying hydrocarbon based gas and a carrier gas. This method has been taught by the prior art, note Awano (US 2002/0163079 A1) and Chen et al ("Field Emission of different oriented carbon nanotube"), however the prior art produces carbon nanotube, not acicular silicon crystals. The invention is not enabled because performing the method discloses is expected to produce carbon nanotubes, not silicon acicular crystal. Furthermore, growth of silicon crystals is not expected without a silicon precursor. The presently claimed invention spontaneously produces silicon crystals without actually supplying a silicon precursor, which is not expected to be able to produce a silicon crystal but rather carbon probes.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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4. Claim 7 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 7 recites, "an n-type low resistivity silicon substrate" in line 2. It is unclear what a low resistivity encompasses. There is no guidance as to what resistivity satisfies low, i.e. 5 ohm-cm or 0.05 ohm-cm.

5. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 5 recites, "in such a manner that they are oriented perpendicularly to the substrate" in lines 3-4. It is unclear what "they" modifies.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1-3, and 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Kanechika et al (US 2004/0079962 A1).

Kanechika et al teaches a silicon crystal needle has an appropriate size, such as a diameter of about several nm at the leading and a height of about 5 to 10 μm ([0052]). Kanechika

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et al specifically discloses a truncated cone **160** having a radius of curvature of several nm to ten or more nm and becomes a sharp conic shape having a height of several μm with a diameter near the bottom of about $0.5\ \mu\text{m}$ ([0144]), this reads on applicant's acicular silicon crystal having a radius of curvature not less than 1 nm to no more than 20 nm at its tip end and having a diameter of bottom surface not less than 10 nm and a height more than the diameter of the bottom surface.

Referring to claim 2, a height of several μm and a bottom diameter of $0.5\ \mu\text{m}$ ([0144]).

Referring to claims 3 and 8, Kanechika et al discloses the needle is perpendicular to the surface (Fig 2D, 3D, 4A).

8. Claim 5, 7 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Awano (US 2002/0163079 A1).

Awano discloses forming acicular crystal (Fig 8) on the surface of a silicon substrate by plasma CVD using a catalyst, such that the crystals are oriented perpendicular to the substrate (Fig 8 and [0096]). The shape of the tip of the crystal in Fig 8 reads on applicant's acicular crystal. Awano also discloses supplying a hydrocarbon gas (methane) and a carrier gas (H_2) and adhering catalyst metal ([0096]).

Awano discloses an n-type silicon substrate ([0130]), this reads on applicant's n-type low resistivity substrate because any low resistivity is indefinite and "low resistivity" has been interpreted by the examiner in an effort to expedite examination to mean a substrate with n-type doping.

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9. Claim 5-6 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al (US 6,221,154).

Lee et al discloses forming silicon carbide nanorods comprising catalytic metal which is deposited as nanoparticles, heating hydrocarbon along with hydrogen to produce the nanorods. Lee et al also discloses a microwave plasma source and growth at a pressure of 5-100 Torr and a temperature of 600-1300°C. Lee et al also teaches forming individual straight nanorods and rods oriented perpendicular with an acicular shape (col 4, ln 40-60 and Fig 6, 8, 9, 11, and 13). It is also noted that the pressure, temperature and reactants taught by Lee et al are within the parameters disclosed by applicant, note pg 13 of the specification.

Referring to claim 6, Lee et al discloses microwave plasma (col 4, ln 5-20).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claim 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanechika et al (US 2004/0079962 A1) as applied to claims 1-3 and 8 above, and further in view of Doris et al (US 5,383,354).

Kanechika et al discloses all of the limitations of claims 4 and 9, as discussed previously, except the surface is coated with a thin carbon film. Kanechika et al teaches a cone can be used as a probe of a scanning type microscope (Abstract).

In a method of making a probe from silicon crystal, note entire reference, Doris et al teaches a silicon probe is coated with a layer of carbon to protect the probe and specimen during scanning (col 3, ln 35-65 and col 4, ln 30-50).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Kanechika et al's probe by coating with carbon, as taught Doris et al to protect the probe and specimen during scanning.

12. Claim 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Awano (US 2002/0163079 A1) as applied to claim 5 above, and further in view of Lee et al (US 6,221,154).

Awano discloses all of the limitation of claim 6, as discussed previously, except the a discharge plasma is generated by microwave plasma.

Lee et al teaches microwave, RF or DC plasma sources can be used to deposit nanorods (col 4, ln 1-20).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Awano's plasma CVD by using microwave plasma, as taught by Lee et al, because plasma CVD clearly suggests using known methods of plasma CVD which includes microwave plasma.

13. Claims 7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (US 6,221,154) as applied to claims 5-6 above, and further in view of MacDonald et al (US 6,027,951).

Lee et al disclose all of the limitation of claims 7 and 10, as discussed previously, except the substrate is an n-type low resistivity Si substrate. Lee et al also teaches a suitable substrate, which can be silicon or any other material suitable for the deposition can be used.

In a method of forming a probe, note entire reference, MacDonald et al teaches a probe is fabricated on an n-type silicon substrate (col 4, ln 45-60). MacDonald et al teaches an n-type silicon substrate, this clearly suggests applicant's n-type low resistivity substrate because any low resistivity is indefinite and "low resistivity" has been interpreted by the examiner in an effort to expedite examination to mean a substrate with n-type doping.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Lee et al by using an n-type silicon substrate, which is known to be used for manufacturing useful probes, as taught by MacDonald et al.


Conclusion

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14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew J Song
Examiner
Art Unit 1722

SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

MJS
March 1, 2007